

MESSENGER Observations of Reconnection and its Effects on Mercury's Magnetosphere

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During MESSENGER's second and third flybys of Mercury on October 6, 2008 and September 29, 2009, respectively, southward interplanetary magnetic fields produced very intense reconnection signatures in the dayside and nightside magnetosphere and very different system-level responses. The IMF during the second flyby was continuously southward and the magnetosphere appeared very active with very large magnetic fields normal to the magnetopause and the generation of flux transfer events at the magnetopause and plasmoids in the tail current sheet every 30 s to 90 s. However, the strength and direction of the tail magnetic field was very stable. In contrast the third flyby experienced a variable IMF with it varying from north to south on timescales of minutes. Although the MESSENGER measurements were limited this time to the nightside magnetosphere, numerous examples of plasmoid release in the tail were detected, but they were not periodic. Rather, plasmoid release was highly correlated with the four large enhancements of the tail magnetic field (i.e. by factors > 2) with durations of $\sim 2 - 3$ min. The increased flaring of the magnetic field during these intervals indicates that the enhancements were caused by loading of the tail with magnetic flux transferred from the dayside magnetosphere. New analyses of the second and third flyby observations of reconnection and its system-level effects will be presented. The results will be examined in light of what is known about the response of the Earth's magnetosphere to variable versus steady southward IMF.